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AUTHOR Bower, George L.; And Others
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This Technical Research Note is designed for reference by high school counselors, service test administrators, and educational specialists as a supplemental guide to the interpretation of Armed Services Vocational Aptitude Battery (ASVAB) results in local guidance and counseling programs. This study examined the validity of specific ASVAB composites for a sample of 6,130 students in 25 high schools offering vocational-technical curricula. School samples were obtained through voluntary participation. (Author)

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TECHNICAL RESEARCH NOTE 74-4

AN ABSTRACT FROM:

# "A CONCURRENT VALIDITY STUDY RELATING THE ARMED SERVICES VOCATIONAL APTITUDE BATTERY TO SUCCESS IN HIGH SCHOOL VOCATIONAL-TECHNICAL COURSES"

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GEORGE L. BOWER, LTC, USA
JOHN R. LEWIS, Ed. D.
BERNARD J. KROCKOVER

RESEARCH DIVISION
ARMED FORCES VOCATIONAL TESTING GROUP
RANDOLPH AIR FORCE BASE, TEXAS

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APPROVED BY

HARRY D. WILFONG, Ph.D
Technical Advisor
Research Division
Armed Forces Vocational Testing Group

RALPH S. HOGGATT
Colonel, USAF
Commander
Armed Forces Vocational Testing Group

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participating counselors, administrative personnel, and principals.

This technical research note is an abstract of a more comprehensive treatment of the data, contained in Armed Forces Vocational Testing Group (AFVTG) Technical Research Report 74-5 (January 1975). Work performed in support of this research was conducted as a subpart of AFVTG research project unit 117; under guidelines prescribed through Department of Defense Instruction 1304.12 (December 1972).


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## PREFACE

This Technical Research Note is designed for reference by high school counselors, service test administrators, and educational specialists as a supplemental guide to the interpretation of Armed Services Vocational Aptitude Battery (ASVAB) results in local guidance and counseling programs.

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AN ABSTRACT FROM:

# "A CONCURRENT VALIDITY STUDY RELATING THE ARMED SERVICES VOCATIONAL APTITUDE BATTERY TO SUCCESS IN HIGH SCHOOL VOCATIONAL-TECHNICAL COURSES"

## I. INTRODUCTION

Previous studies with the Armed Services Vocational Aptitude Battery (ASVAB) have demonstrated its usefulness in predicting success in various military technical training courses. In these studies, ASVAB showed validity in predicting performance for various courses, i.e., Personnel Specialists, Aircraft Maintenance Specialists, Jet-Engine Mechanics, etc. (Vitola, Mullins & Croll, 1973) and Communications Technician, Electrician's Mate, Basic Electricity and Electronics, etc. (Thomas, 1970).

The potential of the ASVAB for predicting performance in civilian vocational-technical courses has not been demonstrated. The validity of the battery has been inferred from results obtained from the above studies and from the inferred commonality between military and civilian jobs. Recently, there has been an upsurge of interest on the part of high school counselors for empirical data substantiating the ability of ASVAB to predict civilian vocational-technical course success.

The study reported here investigated the use of Form 2 of the ASVAB for predicting civilian vocational-technical school success. The results should be of assistance to the counselor when counseling students for specific vocational and academic classes.

The ASVAB consists of nine paper-and-pencil tests which are purported to measure five factors: General-Technical (GT), Clerical (CL), Electronics (EL), General Mechanical (GM), and Motor Mechanics (MM). The composition of these five composites as well as the nine paper-and-pencil tests are shown in Appendix 1. The overall time required to take the battery is 2½ hours. The battery was developed by the Army, Navy, and Air Force research laboratories to be used by all of the Armed Services for selection and classification purposes.

The development of ASVAB may be considered to be predicated upon a concept of general ability. This concept implies some amount of previous learning in a variety of areas which enhances the overall performance of an individual. A problem with such a concept is whether or not a test, (viz. ASVAB), can predict success across vocational areas as identified by the US Office of Education (USOE). The main purpose of this study was to determine how well the battery differentiates special abilities and makes differential predictions. Success (i.e., as measured by student grades) in courses taught in civilian vocational-technical high schools was used as the criterion of how well the ASVAB shows differential predictive ability in different settings.

## II. METHOD

A sample of 6,130 students attending 25 schools offering curricula in vocational-technical courses was used for the study. Distribution of the student sample by state is shown by the numbers in Figure 1.

To be included in this sample, a student must have taken Form 2 of ASVAB (first administered Sep 73) and have been enrolled in a high school vocational-technical course. The various vocational-technical course grades were collected by service test administrators and converted to a common 4.0 scale using the conversion factors as shown in

*Figure 1. Distribution of Student Sample by State*

Table 1. The ASVAB scores were retrieved from the ASVAB historical file at the US Air Force Human Resources Laboratory. Means and standard deviations were computed for the sample on each of the ASVAB Subtests, composites, and the course grade for each course within the study. The time frame for collecting data was April through July 1974.

A multiple linear regression was performed using each student's nine subtest scores on Form 2 of the ASVAB as the independent variables and the student's grade in each specific vocational-technical course as the dependent variable. The Pearson "r" for the current composite ($r_{cc}$) was computed for each course. The multiple correlation coefficients (R) resulting from the regression were tested (F ratio, $p \leq .05$) to determine if the battery could predict course success. Where R indicated the battery could predict success, the significance of the difference between R and $r_{cc}$ was tested (F ratio, $p \leq .05$). For those courses where there was a significant difference between R and $r_{cc}$, a new composite with its associated correlation coefficient ($r_{nc}$), was formed that could predict success with the same degree of confidence as R. The difference between the new and current composites was tested (t test, $p \leq .05$) for significance.

**Table 1**

**CONVERSIONS FOR GPA TO LETTER GRADES**

| Common 4 Point Scale | Percent I | Percent II | 10 Point Scale |
|---|---|---|---|
| A - 4 | A-91-100 | A-93-100 | A+=10 |
| B - 3 | B-81-90 | B-85-92 | A=9 |
| C - 2 | C-71-80 | C-78-84 | A-=8 |
| D - 1 | D-61-70 | D-70-77 | B+=7 |
| F - 0 | F-0-60 | F-0-69 | B=6 |
| | | | B-=5 |
| | | | C+=4 |
| | | | C=3 |
| | | | C-=2 |
| | | | D=1 |
| | | | F=0 |

## III. SOME FINDINGS

Tables 2, 3, and 4 list the 50 specific courses studied, the sample size (N), the multiple correlation coefficient (R), the composites (Selector Composite), and their correlation coefficients ($r_{cc}$ and $r_{nc}$). For 28 of 50 courses studied, which comprised 85% of the sample, the battery did predict course success. For 12 of the 28 courses (Table 2), the current composite was found to predict as well as the battery. This means the current composite is the best group of ASVAB subtests for predicting course success.

**Table 2**

**COURSES PREDICTED BY CURRENT COMPOSITE**

| Course | N | R | Selector Composite | $r_{cc}$ |
|---|---|---|---|---|
| Appliance Repair | 62 | 0.62 | GM | 0.42 |
| Body & Fender Repair | 129 | 0.42 | MM | 0.24 |
| Carpentry | 258 | 0.33 | GM | 0.22 |
| Cosmetology | 159 | 0.46 | GT | 0.37 |
| Diesel Mechanics | 51 | 0.56 | MM | 0.36 |
| Horticulture | 64 | 0.54 | GT | 0.33 |
| Maintenance Mechanic | 56 | 0.66 | GM | 0.40 |
| Metal Working | 124 | 0.38 | GM | 0.25 |
| Nursing | 31 | 0.79 | GT | 0.56 |
| Small Engine Repair | 86 | 0.51 | MM | 0.34 |
| Welding | 147 | 0.56 | GM | 0.49 |
| Wood & Metal Working | 185 | 0.34 | GM | 0.22 |

Selector Composites:
General Technical (GT) = AR +WK
General Mechanical (GM) = SP + 2SI
Motor Mechanical (MM) = MC + 2AI

For the 16 courses (Table 3) where the current composite failed to predict success as well as the battery, new composites were formed that could predict success. Success in the Auto service course, for example, can be predicted with the composite (AI + TK + 1/3 CS).

**Table 3**

**COURSES PREDICTED BY PROPOSED COMPOSITE**

| Course | N | R | Current Selector Composite | $r_{cc}$ | Proposed Selector Composite | |
|---|---|---|---|---|---|---|
| Auto Service | 476 | 0.[illegible] | MM | 0.38 | AI+TK+1/3CS | 0.44 |
| Business Occupation | 265 | 0.43 | CL | 0.36 | AR+WK+1/5CS | 0.42 |
| Clerical Practices | 340 | 0.43 | CL | 0.31 | AR+WK+1/5CS | 0.39 |
| Data Processing | 159 | 0.41 | EL | 0.27 | SP+MC+EI | 0.33 |
| Drafting | 373 | 0.44 | GT | 0.33 | AR+SP | 0.40 |
| Electrical Trades | 468 | 0.41 | EL | 0.34 | AR+TK+EI | 0.37 |
| Electronic Trades | 431 | 0.31 | EL | 0.14 | AR+TK+EI | 0.28 |
| Food Service | 250 | 0.43 | GT | 0.25 | CL | 0.37 |
| Graphic Art | 159 | 0.45 | GT | 0.20 | AR+SP | 0.34 |
| Health Occupation | 170 | 0.55 | GT | 0.30 | CL | 0.51 |
| Journalism | 36 | 0.80 | GT | 0.48 | SP+MC+EI | 0.71 |
| Machine Shop | 345 | 0.36 | GM | 0.22 | TK+AI | 0.33 |
| Masonry | 116 | 0.43 | GT | -0.06 | TK+SP+1/3CS | 0.23 |
| Painting & Decorating | 26 | 0.78 | GM | 0.05 | GT | 0.66 |
| Plumbing | 101 | 0.48 | GM | 0.28 | AI+SP+1/3CS | 0.43 |
| Tailor | 148 | 0.68 | GT | 0.56 | AR+SP+1/5CS | 0.64 |

Selector Composites:

General Technical (GT) = AR+WK
Clerical (CL) = WK+1/3CS
General Mechanical (GM) = SP+2SI
Electronic (EL) = MC+2EI
Motor Mechanics (MM) = MC+2AI

The predictive ability of the ASVAB was not demonstrated for 22 courses (Table 4). It is to be noted the sample sizes in these are relatively small. Their sum represents only 15% of the overall sample.

**Table 4**

**COURSES FOR WHICH PREDICTIVE ABILITY OF ASVAB WAS NOT DEMONSTRATED**

| Course | N | R | Selector Composite | $r_{cc}$ |
|---|---|---|---|---|
| Agriculture | 23 | 0.64 | GT | 0.25 |
| Air Conditioning | 97 | 0.35 | GM | 0.19 |
| Aviation Mechanics | 37 | 0.55 | MM | 0.29 |
| Building Maintenance | 33 | 0.43 | GM | 0.24 |
| Building Trades | 83 | 0.34 | GM | 0.27 |
| Cabinet Making | 17 | 0.89 | GM | -0.60 |
| Child Care | 79 | 0.39 | GT | 0.22 |
| Civil Technology | 18 | 0.89 | GT | 0.23 |
| Commercial Art | 40 | 0.62 | GT | 0.39 |
| Conversation | 23 | 0.55 | GT | 0.36 |
| Cook | 20 | 0.76 | GT | 0.68 |
| Distributive Education | 89 | 0.37 | GT | 0.24 |
| Fashion Design | 23 | 0.79 | GT | 0.31 |
| Household Arts | 64 | 0.35 | GT | 0.22 |
| Industrial Chemistry | 29 | 0.55 | GT | -0.03 |
| Jewelry & Ceramics | 29 | 0.69 | GT | 0.20 |
| Laboratory Technician | 18 | 0.70 | GT | -0.07 |
| Oil Burner Repair | 17 | 0.86 | GM | -0.04 |
| Printing | 102 | 0.33 | GM | 0.09 |
| Restaurant Mgt | 39 | 0.63 | GT | 0.25 |
| Steam Engineering | 14 | 0.70 | GM | 0.27 |
| Transportation | 21 | 0.69 | MM | 0.14 |

## IV. SUMMARY AND CONCLUSIONS

A consideration of the findings which resulted from an analysis of the data resulted in the following conclusions:

1. It appears that, regardless of the significance of the aptitudes evaluated and the measures of attainment used as the criterion, less than half of the variance of the criterion will be associated with the independent variable. This is a finding one might expect in any validity study (Ghiselli; 1966) partially as a function of criterion contamination. Some reasons for this include:

a. Factors which contribute to success, as measured by the criterion, may not be found in the Form 2 of the ASVAB;

b. The degree of reliability of the Form 2 of the ASVAB would cause some of the variance difference; and

c. The secondary school's grading practices would cause the criterion variable to assume a degree of unreliability.

2. Form 2 of the ASVAB aptitudes may not be indigenous to the ability fields being measured. That is, various subtests may measure factors not indicated by their name.

3. In the categories where Form 2 of the ASVAB did not appear to predict success, further research is necessary to determine what confounding variables are contributing to the unknown variance.

For those 22 courses where the total battery did not predict course performance significantly, lack of prediction could have been for a number of reasons, and a contributory factor could have been small sample size. Additionally, the battery might not have been sensitive enough to discriminate in those courses that reflect a diversity of goals or in courses where a number of different aptitudes may be required. There also may be a lack of commonality of interest between what civilian educators think is basic to a particular job and what the military is looking for in a person to fulfill a similar job within the services. In other words, civilian vocational-technical courses may be more specific in a particular course, as compared to the military who are looking for people with a certain level of general ability.

In commenting on the results obtained in this study, it must be noted that they derive from a particular school setting and may not be generalized to other types of educational institutions. The results of the study emphasize the heuristic value of separating abilities into subcategories reflective of diverse demands. The present study indicates that for the most part the Form 2 of the ASVAB does do well in predicting success in a number of vocational courses. For those courses where the Form 2 of the ASVAB does not appear to predict as well in other areas, further exploration is needed to delineate those ability factors necessary for academic success.

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# Appendix 1

## DESCRIPTION OF ASVAB SUBTESTS

### A. TESTS IN THE ARMED SERVICES VOCATIONAL APTITUDE BATTERY (ASVAB)

1. **Coding Speed Test (CS).** In this test there is a key and 100 items. The key is a group of words with a code number for each word. Each item presents one word for which the examinee indicates the code number.

2. **Word Knowledge (WK).** Each item requires the examinee to select the correct synonym for a specific word.

3. **Arithmetic Reasoning (AR).** Each item is a reasoning problem involving application of the arithmetic process.

4. **Tool Knowledge (TK).** Each item presents five drawings of various tools or shop equipment. The examinee indicates which of the four alternative drawings goes best with the lead drawing.

5. **Space Perception (SP).** Each item consists of five drawings: a pattern and four boxes. The question to be answered is which one of the boxes can be made by folding the pattern.

6. **Automotive Information (AI).** Each item asks a question about the identification or operation of automobile parts.

7. **Shop Information (SI).** This test has questions about shop practices and the use of tools. Many of the items contain drawings.

8. **Mechanical Comprehension (MC).** Each item includes a drawing, or drawings, illustrating some physical principle and a question.

9. **Electronic Information (EI).** This test has questions about elementary principles of electricity and about electrical/electronic devices, drawings, and equipment.

### B. CURRENT ASVAB COMPOSITES

General Technical (GT) = AR + WK

Clerical (CL) = WK + 1/3 CS

General Mechanical (GM) = SP + 2SI

Electronic (EL) = MC + 2EI

Motor Mechanics (MM) = MC + 2AI

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